2: Underhill E-5 (1931-1935)1939 NU28 Papago NU28

clearing and felt that, thereafter, he need not share the produce of his fields with those who were using the family inheritance (I, 8, B, 1). As the village grew larger, available land was further and further away: those who took it up moved their residence and the family group became segmented. Ultimately some of the segments had to found new villages.

There are a few examples of men who had land but moved to get something better. These did not relinquish the old land but sent a member of the family to cultivate it so that in the end the family possessed plots at two different Fields (I, 1, A, 1; I, 3, B, 1). There was here a chance for aggrandizement and for a higher standard of wealth than the Papago usually had, but few seem to have thought of warding off starvation in this way. The close family group and the Fields which barely gave it a living, were the rule.

Occasionally families died out and then the Council, on request, assigned their land to someone else. After many deaths, the surviving members often deserted the land on the same principle that they pulled down the house, to prevent its being visited by ghosts. The ghosts would not lure away with them any but the family so it was safe for non-relatives to live there. But they must ask the family's permission and if any of them returned after a safe interval, the land must be given back. But no payment in crops was made during its use.

Since almost every one in a village was related it was rare for any one to move in who was not provided for in some family group. But if a stranger did wish to enter, and take up land, abandoned or new, he went to the Council and asked permission. The Council did not look up his references but simply tried him out. If he proved a desirable neighbor, he was allowed to stay.

The Well villages were composed of groups of relatives, smaller than those at the Fields, since the Well could serve only a limited number. But often the personnel at the Well was somewhat different. The group in 1, 1 were living at the Fields of their mother's family since their father was dead but in winter they went to the Well used by the father's group as they had in his lifetime. Through this sort of shift, a family might belong to two economic groups, one functioning in the dry season, one in the wet. But some, like 1, 5, A, 1 formed a new group and did not change.

Beside the shift from Field to Wells, there were briefer migrations to food gathering grounds where families kept permanent camps. In late June and early July, every family went for three or four weeks to the foothills to gather the fruit of the giant cactus whose juice was fermented for the liquor ceremony. As a rule, each

2: Underhill E-5 (1931-1935)1939 NU28 Papago NU28

221 423 222 village located a good grove in the foothills nearest it and the families chose their camping sites there. In this case there was no consultation with the Council for the cactus groves were very extensive and there was plenty of room. Nearly related families placed their camps together with a picking grove around them a half mile or more square, or such that the women of the combined families could just manage to keep the groves picked clean as the fruit ripened. The next campers settled far enough away so as to give themselves room and not interfere. No one would settle near an established camp unless he was a relative and then only after asking permission and no one, looking for a new camp, would go to the hills already pre-empted by a village not his own.

However, residents of one village often asked their relatives from another village to make cactus camp with them; married daughters came back to camp with their families and people who had formed new Field villages used the old cactus camp. This shifting of personnel furnished almost as much excitement as the journey to a ceremony and formed a relief for relatives living in close contact the rest of the year.

221 273 222 423 A family thus using the cactus grove of a village not their own felt bound in honor to bring the gathered juice to the ceremony of the host village. Tradition says that, in the old days, all juice was fermented in the council house with none kept for private consumption. That constituted the guests ceremonial laborers for the host village. At present a great deal of the liquor is used for home consumption and people want more of it. Also they are less willing to camp in the waterless groves where water has to be transported a long distance and they are beginning to encroach on the groves of people camped in the more accessible places. "But I would not say anything," said a man who had suffered this. "The cactus is for all. We did not make it and the people who pick it are bringing rain." A woman, less tolerant, followed the trespassers all the way out of the grove, scolding them. But the rest of her family disapproved and would say nothing. The Papago tradition of peaceableness was strong.

221 222 423 [252] The cholla and the prickly pear grew in the same general locations as the giant cactus and when they were in season the women of the family went back to the cactus camp for two or three days, drying or eating the prickly pear and pit-baking the cholla on the spot. For each of the other staples they had a special location: mesquite beans by the washes, yucca on hilltops; roots and greens in low wet places. There were no family camps in these gathering grounds but each was understood to be pre-empted by a village or by several related villages.

2: Underhill E-5 (1931-1935)1939 NU28 Papago NU28

The most formal procedure was for one of the older women of the village, frequently the Keeper's wife, to have the gathering party announced by the crier. All the able bodied women of the village would then go out together and pick the spot clean. Each patriarchal family made its own arrangements as to the disposal of the harvest, some putting it in a common storehouse, some dividing it among the various young wives. Women who could not go because of illness or segregation shared the harvest of their families. 222●

The picking lasted three or four days and the women camped in the open, the older ones acting as directors and chaperones. Sometimes an old man or two went with them and, if there were danger of the Apaches, some husbands with bows and arrows. But no man ever worked at food gathering and the guards spent their time hunting rats and rabbits. The women dried or pit-baked their harvest on the spot and made a holiday of it with songs and stories. This was the time when daring youths sneaked to the camp at night and tried to decoy a maiden out into the dark. [836]

Often the women of a village did not go all together but in different family groups at different times. The female head of one patriarchal family would command her youthful subordinates to be ready and might invite the heads of other families. Then they proceeded like the large group. There was little danger of their taking what others might want because no woman could carry more than her one burden basket full, but there was a general feeling that it was wrong to be greedy and not give others a chance. When they returned they made small gifts of their harvest to relatives in the village: gifts which were reciprocated in the usual way.

The mens' deer hunting grounds were determined in a very loose way, like the women's gathering grounds. A mens' hunting party was arranged in the council but not for relatives only, since skilled deer hunters were few. They went to certain mountains rather loosely understood to be pre-empted by their village but no informant could say what would be the consequences if they went elsewhere. "Probably no one would say anything." Then follows another example of the economy of abundance. "There weren't many hunters. There were deer enough." Each hunter's kill had to suffice for the whole of the economic unit to which he belonged, which might mean from two to ten families. He butchered his deer on arrival and then called his children to carry pieces to each household, according to the number of its members. Occasionally "the deer was all gone but the bones before he had finished" and his own family got nothing. But the gifts were, of course, reciprocated and he had done his part toward the support of the unit. 224 423

3: Underhill E-5 (1931-1935) 1936
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But we did not stay at Mesquite Root all the time. We were hungry people, we and my father's brothers and his cousins who lived around us. In those winter days my father went to hunt deer and sometimes we all went with him down over the Mexican border to pick the century plant and roast it or to get stalks for our basketry or clay for our pots.

All the year round we were watching where the wild things grew so we could pick them. Elder Brother planted those things for us. He told us where they are and how to cook them. You would not know if it had not been Given. You would not know you could eat cactus stems and shake the seeds out of the weeds. Elder Brother did not tell the Whites that. To them he gave peaches and grapes and wheat, but to us he gave the wild seeds and the cactus. Those are the good foods.

There was a kind of cactus called cholla, and when its buds were green we all went and stayed for many days picking them, up in the hills. We pulled the tops of some palo verde trees together and piled greasewood bushes over them to make a shelter and there we lived. My uncles made shelters, too, and my mother and my uncles' wives all went together to pick the cactus. They broke off the new stems with tongs and rolled them around on the ground to get the thorns off, and then baked them all night in a big pit. They smelled fresh and fine when they came out. When the big pit was roasting slowly in the night, the women threw green cholla stems on the campfire ashes to cook. We pulled them out, knocked off the thorns, and ate them hot. Ah, good, good food! We ate nothing else for those three weeks. Green things!

At last the giant cactus grew ripe on all the hills. It made us laugh to see the fruit on top of all the stalks, so many, and the men would point to it and say: "See the liquor growing." We went to pick it, to the same place where we always camped, and every day my mother and all the women went out with baskets. They knocked the fruit down with cactus poles. It fell on the ground and all the red pulp came out. Then I picked it up, and dug it out of the shell with my fingers, and put it in my mother's basket. She told me always to throw down the skins with the red inside uppermost, because that would bring the rain.

It was good at cactus camp. When my father lay down to sleep at night he would sing songs about the cactus liquor. And we could hear songs in my uncle's camp across the hill. Everybody sang. We felt as if a beautiful thing was coming. Because the rain was coming and the dancing and the songs.

Where on Quijotoa Mountain a cloud stands
There my heart stands with it.

3: Underhill E-5 (1931-1935) 1936
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At night we camped and my mother-in-law cooked a big pot of gruel. Next day I carried it among my pots so we could stop and eat it at midday. I used to be so hot and thirsty on that journey. Once, running at night, because it was too hot to travel in the day, I caught my foot in a rat's nest. Down I fell and broke all the pottery. My husband said: "Crazy one!" But Shining Evening was good to me on those trips. She was stronger than we women and when I was tired she carried my baby for me. No man could do that; it would not be right. Shining Evening was a great help.

The bean harvest of those Mexicans would be over when we arrived, and they let us go through their fields picking up the gleanings. We girls and our husbands worked, and my mother- and father-in-law went to and fro on our one horse taking the gleanings to a storage place in the mountains.

After that we worked for those Mexicans. We ground wheat and we carried wood and water. The men went up into the hills and hacked off the century plants and roasted them in pits to sell. And there they hunted, and brought down deer and hides to sell to those Mexicans. We women stayed at the foot of the hills and dug clay for pottery. Then my mother-in-law made pots, for she was clever. We young girls sat polishing them all day with little smooth stones. Oh, beautiful pots we made and earned our food! Shining Evening made pots, too, but for whiskey. She would sit there and laugh and say: "Here are my hands and here the clay. I can have what I want. Give me a bottle of whiskey."

Sometimes in the winter we went north to cut wheat for the River People and it was there that I dropped my second baby in a wheat field. And once my husband and I left the babies at home and went alone to harvest figs for the Mexicans. It was in the middle of summer but there were many people at home to work, so we got on our one horse and said: "Look! We will go to earn something for you."

We had never been before without the other Desert People, so we kept a good watch for the Apaches. It was a two day journey and my husband did not sleep all night. We only dismounted for a little while and then I slept while he watched, awake with his arrow strung. But nothing happened until we were coming home.

We passed a flat place where there was a prickly pear growing. I said: "I'm going to eat some." So my husband lifted me off the horse. "Hurry up and pick some," he said. We had a basket hanging on the saddle. I picked the fruit and my man cleaned it and we filled that basket. Then we sat down to eat.

Look, the sun was just coming up. I was facing east and I looked up

4: Joseph et al D, E-5 (1942-1943) 1949
NU28 Papago NU28

Chapter III

MAKING A LIVING IN THE DESERT

241 IT IS obvious to the casual visitor that, even today, making a living in Papaguería demands continuous hard work and careful use of every available resource. Up to the eighteenth century the Papago were semisedentary farmers, who supplemented agriculture with hunting and the gathering of wild plants. Their way of life depended upon making the best use of rainfall and run-off, for the few year-round sources of water were in the mountains. Corn, beans, and squash were planted in small fields in the valleys where the washes fanned out, and, when the July rains came, the flash-flood waters spread over the ground. In many places flood waters were led from the wash to the fields by short ditches, but year-round irrigation was not possible because the washes ran only after a heavy rain. As noted in chapter ii, there is some evidence of an effort to canalize water from the mountains to the fields.

312 The people could remain in the valleys as long as there was water in the
221 *charcos*—which were the only source of water except the flood waters of the washes. When the *charcos* dried up, the villagers moved back to the permanent springs or shallow wells in the mountains. In September and October the Papago harvested their crops, dried what was not immediately used, and stored it in baskets which could be transported easily.

222 Wild plants were an important supplement to field crops, and from April through September much time was spent in gathering them. In the spring the cholla cactus buds were dried and stored, to be boiled and eaten later. In April a kind of wild greens matured. In May and early June came the important saguaro harvest, when families camped in the foothills and picked the juicy fruit from the tops of the tall cacti. Some they ate fresh, and some was dried whole to be used later as candy, though the greater part was boiled down into jam or syrup, and stored in jars to be used as sweetening or to be fermented into wine during the rain ceremony (see chap. vi). In July and August some of the people crossed the Baboquivari Mountains to the high grassland and

4: Joseph et al D, E-5 (1942-1943) 1949
NU28 Papago NU28

oak country to gather acorns. In August another variety of wild greens was ready to eat, and, finally, in September the prickly pear ripened.

Without domesticated animals, the Desert People depended on wild life for their meat, which they dried and stored or ate fresh. All through the year the hunters went out after bighorn sheep, deer, peccary, and rabbits.

This was a way of life in which everyone had to work in order to eat. Someone had to sow the seed or protect the crops while others were gathering wild plants, and, while some of the family were gathering acorns or saguaro fruit, others might be off hunting. And always there was the work at preparing food for eating or storage, making clothes and utensils, and the general business of keeping a family going; small wonder that industry was thought of as a cardinal virtue, for the lazy man would starve and bring others to the verge of starvation. Nor is it surprising that families were strongly cohesive, that they included people other than father, mother, and children, or that babies were welcomed. The more hands, the more co-operative work, the more food. We shall see later that these values remain powerful factors in Papago society today.

FIRST WHITE INFLUENCES ON PAPAGO TECHNOLOGY

When Father Kino came up from Mexico in 1700, he brought cattle and horses, oxen and wooden plows, wheat, peas, lentils, and *garbanzos*. These the Papago accepted according to their own pattern. It is possible that they simply turned the cattle loose and hunted them much as they had always hunted deer.[1] At any rate, for years there were semiwild cattle in the southern and eastern parts of what is now the Papago Reservation. The wheat and legumes fitted more naturally into the Papago pattern. They were planted in winter in the same fields used in summer for corn, so that there were now two growing seasons instead of one, which somewhat regularized the food supply.

Horses were very useful, easing the difficulty of the semiannual treks from mountain to valley and return and shortening the traveling time between villages. However, like many other tribes, the Papago attached to the horse a value quite out of proportion to its usefulness, and ownership of horses became a source of prestige. Horses and cattle were individually owned, in contrast to land, to which an individual had a right only while he was using it.

1. Ruth Underhill, "Acculturation at the Papago Village of Santa Rosa," p. 12. In contrast, a group of Indians in northern Mexico closely related to the Papago, who were completely "mission-ized," used white methods of handling stock; yet they violently resisted white encroachments, even to the point of bloody revolt.

PLATE IX

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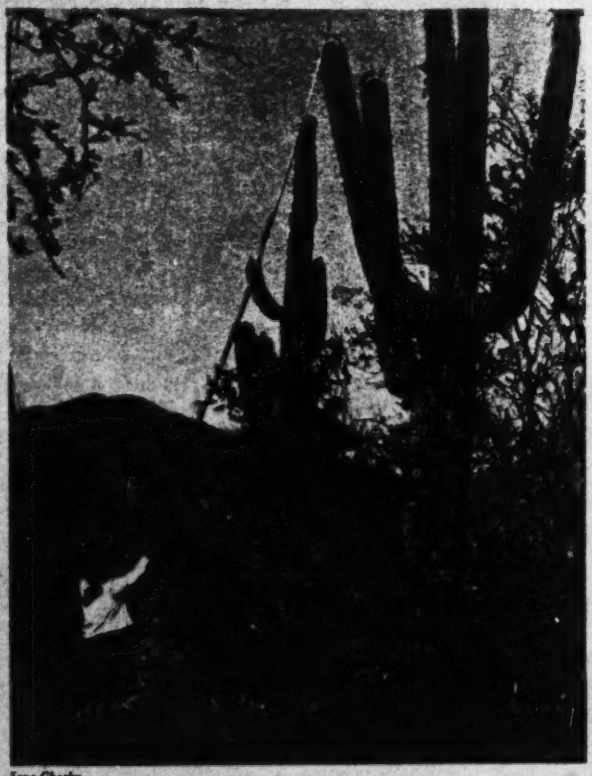

Jane Chesley

a) Picking the fruit from the giant saguaro

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Jane Chesley

b) The fruit goes into an oil's for cooking

AT THE CACTUS CAMP

[p. 75]

5: Castetter & Bell N-5 (1938-1940) 1942
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products. However, his visit may have followed a season when no crop was planted on account of late rains, such as Kino[36] cited in 1701 in the vicinity of San Rafael del Actúm Grande (in southern Arizona), where no maize had been raised by the Papago that year because of a like situation.

All our informants agreed that wild plants and animals formerly constituted a much larger, and much more dependable, fraction of the total Papago food supply than did cultivated plants. Seasonally women devoted themselves to the gathering of wild foods while men and boys hunted rabbits. When the wild foods ripened, large quantities were gathered and stored, but, just before the giant cactus harvest, food became very scarce, as indicated by one of their names for the period that would correspond to our month of May, *ko'ohk macat*, "the painful moon." One informant said that when he was a boy it was not uncommon to "be so hungry that a person became dizzy when he stood up." As in the past, so today, the Papago utilize much more wild plant and animal food than do the Pima; in fact, it is now comparatively rare to find the Pima gathering wild foods of any kind, while many Papago still utilize them to some extent as a matter of necessity, for Papago agriculture is today almost as precarious as in olden times.

Underhill[37] has well pointed out that poor as the Papago country was, its economics were those of abundance. Much the same outlook is still to be observed among the Pima, despite their deculturation. The Pimans did not hoard property; they were constantly making gifts, chiefly of food, for their food supply, meagre though it seems viewed from our standard of living, was more than sufficient for their simple needs, and anything beyond the bare necessities for sustaining life was regarded as a surplus. Papago migratory life, involving the difficulty of food storage, added to the problems of preserving food in so hot a land, greatly fostered

[36] Bolton, *loc. cit.*
[37] Underhill, *Papago*, pp. 90-2.

5: Castetter & Bell N-5 (1938-1940) 1942
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was on a lower technological level than that of the irrigated valleys of Sonora, these Indians were relatively good farmers. Despite the fact that they, particularly the Papago, cultivated small acreages, they did so intensively. The supreme Piman virtue was industry. The farmer arose before sunrise, worked without cessation until near noon and rested during the hottest part of the day, then continued work until dark. The heat prevented rapid labor, hence his toil was slow and plodding but unremitting.

* * *

Utilization of Native Wild Plants

In the Papago region certain wild staple foods grew in abundance and were extensively utilized. Highly important among these were the fruits and seeds of sahuaro *(Carnegiea gigantea)*, and, in the southern part of Pimería Alta, organ-pipe cactus or pitajaya[67] *(Lemaireocereus Thurberi)*. Of such value was sahuaro that each family established a permanent camp in the nearest available cactus area; its significance is further indicated by the fact that sahuaro harvest marked the beginning of the new year in the calendars of both Papago and Pima. Kino noted the extensive use of pitajayas in the Indian diet in traveling among Papagos from the Gila River to La Concepción (Caborca), as well as in the vicinity of San Luis Bertrando where he observed that the numerous pitajayas lasted the Papago until December.[68]

Another very outstanding food was cholla buds, fruits and joints, and some informants regarded cholla buds of even more importance than sahuaro fruit. Buds of the abundant *Opuntia echinocarpa* and of the jumping cholla *(O. fulgida)*, gathered in May, and the fruit, which ripened in late summer, were pit-baked and constituted staple foods, while the fruit and sometimes buds and young joints of the varí-colored

[67] Pitajaya or pitaya here refers to the fruit of either or both *Carnegiea gigantea* and *Lemaireocereus Thurberi;* sahuaro invariably refers to *Carnegiea gigantea.*

[68] Bolton, *Kino,* I, 256.

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cholla *(O. versicolor)* and of the related *O. spinosior* were valued to some extent. The fruits, and to a lesser degree the joints, of prickly pear cacti of several species, especially *O. Engelmannii,* ranked high in the diet. That such fruit, known as tunas, was a staple food in Kino's day is indicated by his experience among the Papago near Santa Eulalia (in Sonora);[69] Anza,[70] three-quarters of a century later, observed that among the Papago at Quitobac, "*abrojos* which they scald, taking off the spines" were one of the usual foods. This was doubtless the fruit of a species of *Opuntia.*

Another Papago staple was the fruit and seed of mesquite *(Prosopis chilensis),* so plentiful in the interior valleys of the Papago country. Still to be found near all their watering places are the mortars in solid rock, known as "*pechita* holes," in which mesquite beans were ground. In this connection, Kino[71] noted that at Papago *rancherías* at Santa Viviana his party was given mesquite. Of somewhat less importance were the seeds of ironwood *(Olneya tesota)* which were ground and leached, those of Jerusalem thorn or horsebean *(Parkinsonia aculeata),* and paloverde *(Cercidium microphyllum).*

Staple root crops were the sand root *(Ammobroma sonorae),* often referred to as wild potato or wild sweet potato; *Franseria tenuifolia,* which grew on the flood plains near the villages, and to a lesser extent *Monolepis Nuttalliana.* Entire families went out with digging sticks to gather these several roots, and lived on them while they lasted. Bulbs of *covenas* or Papago blue bells *(Brodiaea capitata* var. *pauciflora)* were of less importance, usually eaten raw in early spring before other foods were available. Mange[72] wrote in 1694 that the food of Indians (doubtless Soba) at *rancheria* El Comac in Sonora was "some roots of wild sweet potatoes [probably sand root, at least in part], the pitaya in their sea-

[69] *Ibid.,* p. 144.
[70] Bolton, *Anza,* II, 22, 150.
[71] Bolton, *Kino,* II, 207.
[72] Mange, *op. cit.,* pp. 216, 225.

5: Castetter & Bell N-5 (1938-1940) 1942
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son and a red fruit which is given toward the sea." Also that the Papago south of Vacpia (in Sonora), who had never before seen Spaniards, sustained themselves with "roots or wild sweet potatoes," mesquite and other small fruits. He also makes mention of the importance of roots near La Luna Eddy, at Bacapa and at Basotucán (in Sonora).[73] Likewise Font[74] referred to sahuaro, pitaya, seeds of various grasses and various roots similar to the sweet potato *(camote)*, as well as *covenas* among the Papago. In 1912 Lumholtz[75] wrote that during March and April the Papago in certain areas formerly gathered in the large barren sand hills and lived almost exclusively on sand root, also that *covenas* furnished the Papago a favorite food supply.

Mescal *(Agave Palmeri, A. Schottii, A. deserti* and *A. americana)* was used to a fair degree by those Papagos who were within reasonable access of it or could obtain it by trade, but was more of a delicacy. It was to be found only in the higher mountains and not in abundance, and was often gathered along the Mexican border and pit-baked by parties who went to Sonora to labor. The fruit of *datil (Yucca baccata)* furnished variety to the diet and was always gathered in August by the men when available, but plants often failed to fruit. Yucca was obtainable on the plains of the Papago country only at the head of the Altar Valley.

Small greens utilized in their season were amaranth, pigweed or *bledo (Amaranthus Palmeri)*, lambsquarter *(Chenopodium* spp.) and saltbush *(Atriplex Wrightii)*. Cañaigre *(Rumex hymenosepalus)* was of less importance. These, particularly pigweed, were never dried and stored but while in season constituted the main, if not the only, article of diet.

Acorns were highly valued but neither common nor easily accessible. Wherever those of black oak *(Quercus Emoryi)* or *Q. oblongifolia* were available without too much effort, or

[73] *Ibid.*, pp. 283, 285, 286-87.
[74] Bolton, *Anza*, II, 320.
[75] Lumholtz, *New Trails*, pp. 318-19.

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222 262 137 could be secured by trade, they too constituted an interesting adjunct to the diet, and were eaten without leaching. These were found largely in the southern part of the Papago territory, as in the Baboquivari Mountains and the orchard-like forests of oak in the Tumacácori Mountains. Velarde[76] reported the important fruits of the land were tree cactus (evidently sahuaro and pitajaya), tunas, acorns and wild nuts.

The Papago formerly utilized to a fair extent the small seeds of several species of plants, but these largely have fallen into disuse. Most valued were tansy mustard *(Sophia pinnata)*, amaranth *(Amaranthus Palmeri)*, saltbush *(Atriplex* spp., especially *A. lentiformis)* and lambsquarter *(Chenopodium murale)*. Boxthorn *(Lycium Fremontii)*, gathered in early summer, was the most highly prized of the berries.

The Sand Papago, mentioned by Gifford,[77] and the most nomadic of the Papago, lived on wild foods supplemented by vegetables obtained from the Yuma in exchange for Gulf shells. Lumholtz[78] described them as depending chiefly upon the sand root, gathered the year round, and mentions a Sand Papago hermit who lived almost entirely on this root; they also extensively utilized chia *(Salvia chia)* as well as mesquite beans, in search of which they traveled as far as Quitobaquito, Santo Domingo and the lower Sonoita River. Also of considerable importance were sahuaro, pitajaya, *palo fierro* or ironwood, and a succulent plant of the sand dunes, *hierba salada (Oenothera trichocalyx)*, which was prepared by boiling. Díaz[79] noted in his diary (1774) that the Papago (doubtless Sand Papago) living in the sierras between El Carrizal and the Gila, in extreme southwestern Arizona, maintained themselves, so far as plant food was concerned, on mesquite, screwbean, pitayas, tunas, sahuaro and certain roots. Although the Sand Papago almost completely lacked agricul-

[76] Mange, *op. cit.*, p. 309; Wyllys, *Velarde's Relación*, p. 128.
[77] Gifford, *The Cocopa*, p. 262.
[78] Lumholtz, *op. cit.*, pp. 204, 330-33.
[79] Bolton, *op. cit.*, pp. 260-61, 265.

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ture, a single agricultural site is attributable to them at Suvuk, southeast of Tinajas de Emilia, in Pinacate. Here, by means of the planting stick, were sowed on a very small scale maize, beans and pumpkins. Once a year they journeyed to the Yuma and bartered baskets and sea shells for maize, teparies and pumpkins. Emory[80] observed that they subsisted principally on fish.

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Our Pima informants agreed that the predominant ancient native food plant was mesquite, followed in order by sahuaro fruit and cholla buds. Garcés, in 1774, encountered Pimas from the village of Sutaquison, on the Gila, gathering sahuaro; and Font[81] a year later wrote of the Gila Pimas having an evil odor because of the mesquite flour, screwbeans and grass seed which they ate. In this same connection Bartlett[82] wrote, in 1854, that the Pima granaries were filled with mesquite beans and sahuaro fruit (in addition to wheat, corn, beans and pumpkins), and twenty years later Grossmann[83] noted the great importance of mesquite as a Pima food. Similarly Russell[84] found the most important, abundant and accessible Pima wild foods were mesquite and sahuaro; even in his day both were extensively utilized. This is supported by Whittemore's[85] statement in 1893: "The *principal* article of food was the bean of the mesquite, ..." which was gathered by large parties. Lloyd[86] also says that, up until shortly before 1903, mesquite beans and fruits of various cacti were staple articles of food. One informant, Manuel Lowe, insisted that cholla buds formerly constituted the most staple wild plant food. The jumping cholla *(O. fulgida)* was very plentiful on plains adjacent to the Gila and therefore easily accessible. However, *O. echinocarpa* thrived more in the hotter areas.

[80] Emory, *Report on the U. S. and Mexican Boundary Survey*, p. 123.
[81] Bolton, *op. cit.*, pp. 388; IV, 44.
[82] Bartlett, *op. cit.*, p. 264.
[83] Grossmann, *op. cit.*, p. 419.
[84] Russell, *op. cit.*, pp. 66, 71, 74.
[85] Whittemore, *op. cit.*, p. 54.
[86] Lloyd, *Aw-aw-tam Indian Nights*, pp. 123-24.

5: Castetter & Bell N-5 (1938-1940) 1942
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which some of their ceremonies centered. Pima informants maintained that as a source of animal food it ranked second only to the black-tailed jackrabbit which was also emphasized in Pima ceremonials. More rarely hunted by both peoples was the Arizona white-tailed deer *(Odocoileus couesi)*, found only in the mountains. Antelope *(Antilocapra americana)* were formerly quite plentiful, as indicated by the fact that the international boundary survey of 1892-94 found antelope in every open valley along the border between Nogales and Yuma. They were sometimes stalked by both peoples, particularly in the tall grassland in the eastern part of Pimería, but did not constitute a dependable source of food and were more rarely hunted than were deer. When the Gila dried up, as it did periodically, both Papago and Pima stalked deer and antelope at water holes. Bear were not taboo, but were never hunted.

Some information on early utilization of animals was presented by Kino, who related that in 1698 Sobaipuri Indians at Quſburi, on the San Pedro, furnished him various "spoils" including buffalo and deer skins, also buckskins at San Xavier del Bac. The buffalo hides were doubtless obtained from farther east, either by trade or through hunting expeditions. Toward the end of his memoir he writes of the natives of Pimería having many deer and buffalo hides, and antelope skins.[88] Likewise Font,[89] writing in 1775, noted that the Gila Pima women covered themselves with deer skins. Velarde,[90] too, writes of the many deer in Pimería, pointing out that among the Indians to the west the hunting of deer was more common. The Soba at Pitiquín and Caborca were absent hunting deer when Mange[91] visited there in 1694, and the Soba men at El Comac were nude, only the women clothing themselves with "soft skins of hare and deer." In the

[88] Bolton, *Kino*, I, 183, 292; II, 267.
[89] Bolton, *Anza*, IV, 49.
[90] Mange, *op. cit.*, pp. 310, 312; Wyllys, *op. cit.*, pp. 129, 131.
[91] Mange, *op. cit.*, pp. 216-17, 220.

5: Castetter & Bell N-5 (1938-1940) 1942
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being rather extensively utilized. An early reference[103] characterizes the Papago as living on seeds, grass, rabbits, rats and wild fruits. Pi Pa 136 224 262

A few birds were included in Piman diet, Gambel quail *(Lophortyx gambelii)* providing the main source of supply, with the abundant western white-winged dove *(Melopelia asiatica mearnsii)* and the mourning dove *(Zenaidura macroura marginella)* also ranking high. The only eggs utilized were those of the Gambel quail. Merriam turkey *(Meleagris gallopavo merriami)* was so be found more plentifully in the mountains formerly than at present, but was hunted only occasionally and then mostly for feathers rather than food. It was not domesticated, although Velarde[104] noted this would not have been difficult. Russell makes no reference to the use of turkeys by the Pima. Velarde relates that in Pimería there were countless turkeys in the mountains. In the same connection he states: "In some places are found thousands of birds *(pavos o gansos)* which are called chickens of the Indies, large and fat and of pleasant taste."[105] These, too, unquestionably were turkeys. Pi Pa 262 136 223

Highly prized as food by both peoples, but more especially by the Papago, were the larvae of the very common lined sphinx moth *(Celerio lineata)* which is two and one-half to three inches long. These caterpillars occurred in great numbers in limited areas on any vegetation, especially amaranth *(Amaranthus Palmeri)*, during or immediately following the rainy season. With their appearance everyone dropped work to gather this great delicacy, which was dried and stored. This is what Garcés[106] referred to, when on a journey from Tubac to San Gabriel he noted the Papago ate Pi Pa 136 262 222

[103] *Documentos*, 3rd ser., IV, 554; *Rudo Ensayo*, p. 150; Hrdlicka, *op. cit.*, p. 84.

[104] Mange, *op. cit.*, pp. 309-10; Wyllys, *op. cit.*, pp. 129-30.

[105] Mange, *loc. cit.*; Wyllys, *loc. cit.*

[106] Bolton, *op. cit.*, p. 320.

5: Castetter & Bell N-5 (1938-1940 1942
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and dried for storage "some yellow-green worms." It is also mentioned by Lloyd.[107]

Lumholtz[108] described the Sand Papago as depending for their animal food upon jackrabbits, which were caught by running them down in the sand; mountain sheep, mule deer and antelope, all three killed with bow and arrow; and muskrats, lizards, and fish obtained on the Gulf Coast. Similarly Díaz,[109] in 1774, observed that the Indians (doubtless Sand Papago) living in the sierras between El Carrizal and the Gila, in extreme southwestern Arizona, maintained themselves on deer, mountain sheep and rats (also mesquite, screwbean, pitajaya, sahuaro, tunas and certain roots). Only one of Underhill's informants, a Sand Papago from Sonora, had any recollection of mountain sheep hunting.

Mange's[110] account informs us of the poverty of some of the Papago as well as the utilization of certain animal foods not heretofore mentioned. Thus he referred in 1699 to a *rancheria* at an eddy, twelve leagues from the Eddy La Luna (in extreme southwestern Arizona), where there were thirty nude and poor Indians "who only sustained themselves with roots, locusts and other wild fruits." Also at Bacapa *rancherías* there were eighty Papagos, nude and poor, who "at times of the year they sustain themselves with shellfish." Likewise, at Basotucán (in Sonora) were nude and poor Papagos whose only sustenance was roots, some shellfish, locusts, and lizards which they called iguanas. One reference characterizes the Papago as not disdaining, in seasons of scarcity, "even snakes, lizards, and toads."[111]

The dog was really the only animal domesticated by either Pima or Papago. A few species of birds were kept captive for their feathers, especially the golden eagle (*Aquila chrysaetos*), the thick-billed parrot or macaw (*Rhynchopsitta pachyrhyn-*

[107] Lloyd, *op. cit.*, p. 124.
[108] Lumholtz, *op. cit.*, pp. 204, 350-53.
[109] Bolton, *op. cit.*, pp. 260-61, 265.
[110] Mange, *op. cit.*, pp. 263, 285, 286-87.
[111] Bancroft, *Native Races*, I, 550.

5: Castetter & Bell N-5 (1938-1940 1942
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cultivation of the kidney or common bean (*P. vulgaris*), must await additional data.

Lumholtz,[52] writing of Mexico, noted he had not seen the tepary bean outside of Sonora, although Piper[53] says that in its wild form the species ranges from western Texas to Arizona and southward in Mexico to Guadalajara. It is widely distributed along the western coast of Mexico, and the Russian workers under the leadership of Vavilov have found it under cultivation in Chiapas. They regard *P. acutifolius* A. Gray var. *latifolius* Freeman as having originated in the South Mexican-Central American center.[54] However, Dr. D. D. Brand, of the Department of Anthropology of the University of New Mexico, informed us in personal conversation that he has carefully and systematically examined the markets in western Guerrero and southern and western Michoacan, and in not a single case has found any teparies. One might expect that since they are found in Sonora and in Chiapas they would be found along the entire Mexican west coast. In view of the wide distribution and varietal diversity of the wild tepary, the region where it was first brought under domestication and the wild form from which it was developed need further investigation. In the absence of proof of its origin from the wild forms of *P. acutifolius* A. Gray var. *latifolius* Freeman, perhaps its origin should be sought in varieties farther to the south. Detailed genetic and cytological studies would be of great value in solving the problem of origin.

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The Papago, at least, formerly gathered and ate wild teparies. Freeman[55] stated that two old Papago women informed him thirty years ago that they remembered having gathered dark-colored wild teparies during their childhood

[52] Lumholtz, *New Trails*, p. 287.

[53] Piper, *op. cit.*, p. 693.

[54] Vavilov, *Botanical-Geographic Principles of Selection;* Bukasov, *The Cultivated Plants of Mexico, Guatemala and Colombia*, pp. 475, 485, 505.

[55] Freeman, *op. cit.*, p. 11.

5: Castetter & Bell N-5 (1938-1940) 1942
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in the mountains farther south, presumably in Sonora. Thornber[86] informs us that in 1914 he saw an astounding quantity of wild teparies growing near Santa Rosa, just south of the Santa Rosa Mountains on the Mexican border, and that a group of Papago women were gathering the ripe seeds. None of our own informants had any knowledge of the utilization of wild teparies.

From samples of cultivated tepary secured from the Papago and Pima, Freeman isolated and grew forty-seven distinct types, differing chiefly in flower color, and shape and color of seeds. Growth habit, foliage and pod characters of these types showed little difference, except that the white-seeded sorts had slightly smaller leaves than did those with yellow or darker colored seeds.

Both Papago and Pima had only two staple varieties of tepary—the white (really greenish white) and the brown. Black and variously speckled teparies also occurred but were rarely selected or grown as distinct varieties, and many Papagos and Pimas would pull up and discard such plants when found among crops of the white and brown ones. Informants of both tribes, with a single exception, regarded the brown as the oldest of the teparies. A present day factor which limits the growing of teparies is the commercial demand for only the white and brown varieties. The one most commonly found on the commercial market is the white, and this is often brought to trading posts for barter. Both tribes regard the white one as superior in taste and general quality to all the others.

That the kidney bean *(P. vulgaris)* was aboriginal in the Southwest is authenticated by its occurrence at a number of sites in the San Juan Basin belonging to horizons as early as Basket Maker III, such as those of Kidder and Guernsey.[87]

[86] J. J. Thornber, Professor of Botany, University of Arizona, Personal conversation, Apr. 26, 1940.

[87] Kidder and Guernsey, *Archeological Explorations in Northeastern Arizona*, p. 98.

5: Castetter & Bell N-5 (1938-1940) 1942
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gan by Charles R. Steen, Ranger. Jones[113] reported that these pipes (as well as others taken from a ceremonial cave on Camelback Mountain near Phoenix) were made of reed grass *(Phragmites communis)*. The pipes from Casa Grande were wrapped with cotton cloth, and both lots were stuffed with leaves of creosote bush as well as broken tobacco leaves. Jones is of the opinion that these are probably leaves of *N. attenuata*. In this same connection it is interesting to note that Fewkes[114] found large numbers of "cane cigarettes" in various rooms at the Casa Grande ruin as well as in caves near Superstition Mountain to the north of the ruin. Of special interest is the fact that he found a small dish of *N. attenuata* in one of the ruins at Casa Grande.

It is our firm belief that neither Papago nor Pima cultivated any kind of tobacco aboriginally, a situation in agreement with that for the Maricopa[115] who were adjacent to the Pima on the Gila, but that they did smoke the wild *N. trigonophylla* and *N. attenuata*.

Martynia

Pima and Papago anciently utilized the pods of devil's claw or unicorn plant *(Martynia louisiana)* in basketry. Although informants asserted that the Pimans cultivated this plant a very long time ago it is impossible to establish this definitely. It is possible that aboriginally they utilized only wild plants of *Martynia*, and that its cultivation came with the commercial stimulus to increased production of baskets.

There were two kinds of devil's claw—a black-seeded variety which grew wild, and a cultivated form with longer pods and white seeds, the longer strips of epidermal tissue being more suitable for making baskets. The white-seeded variety never grew wild but often appeared as a volunteer in cultivated fields.

[113] Jones, *Ceremonial Cigarettes*.
[114] Fewkes, *Casa Grande*, pp. 142-43.
[115] Spier, *loc. cit.*

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CHILI

Chili *(Capsicum annuum)* was introduced among the Pimans by Kino[125] toward the close of the seventeenth century, but its cultivation was not taken over extensively. Only a few Pima grow it at present and it is cultivated by the Papago only in very favorable places. The chief variety grown is Anaheim.

Aboriginally, and even to the present, the Papago and Pima have used fairly extensively for seasoning the native, spherical, small-fruited, but very pungent, Bird Cayenne or Spur pepper *(Capsicum frutescens* var. *baccatum)*, commonly known in the Southwest and in Mexico as *chiltepiquín*,[126] which grows wild in moist places in the Baboquivari Mountains and southward in Sonora. It did not occur in Pima territory but was secured by trade with the Papago. It was never cultivated by either people. Papago made expeditions to secure *chiltepiquín;* they pulled up the entire plant which they brought home for drying, then picked the fruit and stored it in a sealed olla. They always arranged to have some on hand. Its early use in Sonora was described by Pfefferkorn.[127]

[125] Bolton, *Kino*, I, 122-23, 204, 248-49, 253, 321; II, 80, 100, 138, 165, 265.
[126] Also spelled *chiltipiquín, chilepiquín, chiltepín* and *tschiltipín*.
[127] Pfefferkorn, *Beschreibung der Landschaft Sonora*, I, 62-3.

6: Densmore E-5 (1920)1929 NU28 Papago NU28

they were predicted. He said, "At that time men wore nothing but the G string. They rose before daylight and went out to look for Apache. See! If young men do this now they get sick and can stand nothing; they take cold and die.")

Preparations for the saguaro festival began in June when the fruit of the saguaro cactus was gathered. The fruit grows at the top of the cactus, which is a column 20 to 40 feet in height. The implement used in gathering the fruit is a long pole with a hook at the end. Much importance is attached to the shape of the hook, and the group of stars known as the Big Dipper is called the Cactus Hook because of a fancied resemblance. The work of gathering the fruit and making the sirup was done in places called cactus camps, several families combining in the work. The equipment of such a camp consisted of a thatch in a tree, on which the cactus fruit was spread to dry, and a covered fireplace. A few ollas were usually left in the camp and were not disturbed by travelers. A deserted camp south of Santa Rosa was visited and photographed. (Pl. 19, *a*, *b*.)

The cactus fruit was boiled in water, strained through a mat of grass or branches to remove seeds, etc., the juice was then boiled down to a sirup and placed in ollas, and sealed with a bit of broken pottery covered with mud. At the time of the ceremony these ollas were opened and the sirup mixed with water and allowed to ferment, making "tiswin." Smaller ollas were also filled for household use, as the sirup mixed with water and not fermented is a pleasing drink in hot weather. The sirup might be either light or heavy and could be kept for a year. If kept for a long time the color became dark. A similar drink was made from the fruit of the "organ-pipe" cactus.

The following incident was related concerning one of these camps. It was said that while the older people were busy with their work seven children strayed away from the camp and were lost. Their parents searched for them several days but could not find them. In the camp there was a man whose dreams usually came true. When the parents could not find the children they went to him. One night he "dreamed a song" and the next morning he saddled a pony and went to a place called Vĭtnikût. When he got to the place he found footprints of children and followed them all over the mountain. Finally he saw a boy in the bushes. He got down, tied his horse, and went toward the boy. When the boy saw the man coming he ran farther into the bushes, told the other children and they all ran away. The man chased and finally caught them and brought them home. They had been lost for eight days and would have perished without water.

The song heard by the medicine man in his dream told him that the children had not died of thirst. It had rained where they were and the water had stayed in a little "water hole." The children had

7: Lumholtz N-5 (1909-1910) 1912
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here also bees deposit their honey and bats make their homes. Sometimes rabbits attack the stem to get at the juicy pulp. 137

To the Indians the sahuaro is invaluable, and by tacit understanding they consider it a crime to cut one down. The grateful fruit comes at a time when most needed, and the Indians leave their habitations to camp among the sahuaro as long as the season lasts. Not only does the fruit then furnish them with their principal means of subsistence, but the greater part is boiled down to a sirup for future consumption in the winter, serving also as material for an intoxicating drink, which is used at the sahuaro festival. The seeds, too, are eaten after having first been ground on the metate, and they taste better than would be expected; the Indians also feed their fowls with them and many sackfuls are brought back to the houses after the sahuaro harvest. The wooden skeletons or ribs of the sahuaro furnish the Papago with light, strong, and elastic building stuff, and from the same material he makes the long stick which is needed to bring the fruit down from its lofty elevation, coloring the pole red with the juice of the fruit. Also chicken coops, chairs, traps, and similar articles of the household are manufactured from sahuaro ribs. Even the wooden tissue bags produced by the woodpeckers are made to serve as water bottles or drinking vessels. 222 [252 273] [342] [322] [415]

So important a part does this cactus play in the life of the Papago that their year begins with the sahuaro harvest. The season lasts from the middle of June till the middle of July. Every rancheria is supposed to make [805] 222 796

7: Lumholtz N-5 (1909-1910)1912
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a feast for the occasion, which will insure rain and good crops. An essential part of the festival is the drinking of wine, produced by mixing the sahuaro sirup in a certain proportion with water and allowing this to ferment. The name of this greatest festival of the year is *naváita*, derived from *návait*, their word for the wine.

Elder Brother, so their tradition runs, created the sahuaro by placing beads of his perspiration in the ground. He walked in ceremonial circuits around it in four days, and the plant began to give fruit. He also made a jar in which he put the juice of the fruit which he mixed with water. "Let us see if we can not make rain with this to refresh the thirsty soil," he said to the jar. And its contents became wine, and it began to rain, as he thought it would. Therefore, to this day, the Papago make sahuaro wine and celebrate a great feast in accordance with Elder Brother's commandments. The wine was given by him in order that they might get drunk, and then rain would follow.

On our arrival at the rancheria of Noria we learned that the wine making had been started that morning. The festival was to begin in the evening, the singing and dancing lasting as usual for two nights, by the end of which time the wine would be ready for consumption. An hour after dark, as we were preparing our supper, a loud Indian voice from the other side of the arroyo on which we were camped sounded forth in the dark, still night, inviting people to gather for the festival. Standing in front of the medicine lodge, facing the east, the herald announced over and over again: "Darkness has

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796 matter how many small arroyos there are, the clouds cover them all. When the rain comes down, the flood carries along the sand and the loose trunks and the sticks and fallen branches, piling it all up. The clouds and the winds get up and stop in the west, whence the rain spreads over this poor earth. When shall we see this again?" The speech was briefly answered at each mat, and from either side the friendship which they all felt for each other was emphasized. The singing was quite enjoyable and there was a pleasing atmosphere of antiquity about the proceedings. Finally, the chief arose to make a speech in which he warned every one to behave properly while partaking of the wine which had been brewed in the houses.

The official part of the festival now being over, people repaired to the houses, where the sahuaro wine flowed through the evening and night. Friends from the neighboring country added to the merriment. Both men and women become intoxicated on such occasions, and, formerly, quarrels of long standing were settled at the feast according to the laws of the vendetta. Murder used to [622] be of frequent occurrence, but, to prevent the possibility of quarrels ending in a fatal way, the chiefs of our time are wise enough to gather up beforehand all the knives, pistols, and rifles, returning them to the owners after the conclusion of the festival.

•222 It should be noted that in March, about the time of the equinox, a ceremony, accompanied by singing, is performed to insure a good sahuaro harvest. Seeds of the fruit are ground and put in a basket into which also

7: Lumholtz N-5 (1909-1910) 1912
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four sticks, taken from the dried plant, are placed, one at each cardinal point. Sitting around the basket, people spend a night singing, while the medicine-man makes prognostications for the coming harvest. The seeds are eaten by those present, and the four sticks are given to four persons who later, when the season comes around, leave them at the foot of a sahuaro.

As soon as the Indians were rested enough after the celebrations that ended the festival, I had an interview with Chief Alvina, whom I found to be conscientious about the information he imparted, and in a charmingly sincere way not afraid of telling anything. His father, who had died two years before, had been chief before him. The Papagoes declined to tell anything about their beliefs and ancient customs, he said, but he could see no harm in letting strangers know about them. Unfortunately for me, his knowledge of those matters was not commensurate with his liberality. Furthermore, he always told his people that there was no harm in being photographed. Their fear he could not comprehend. He had himself been photographed many times, and he never inquired as to what they were going to do with his photograph.

It was a very exceptional stand he had taken; as a rule, the Papagoes have the greatest objection to the camera. They are not afraid of it, but are intensely annoyed at the photographer's efforts, because, in their opinion, part of themselves will be taken away and will always remain behind after death, causing much disturbance to the departed, who in that way will be, so

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me from finishing the operation by telling him to ask eight additional dollars for his consent.

Their camp consisted simply of a roof of branches resting on four poles, sufficient to provide some shade during the day. Early in the morning all the female members of the household could be seen proceeding on their fruit-gathering expedition, each armed with a large basket and the usual pole, about twenty feet long and made from two pieces of sahuaro rib. At the top of the pole, as well as lower down, there is a kind of hook made by tying crosswise in these two places a small piece of greasewood by the aid of which the spiny fruit is broken off. Two or three hours later they returned, each carrying on her head her share of a heavy harvest. The skin with its spines had been removed in the field, so the inside of the huge water-tight basket presented an appetizing mass of crimson fruit pulp, as well as a great amount of similarly colored juice, which would keep for a few hours only. Most of the contents of the baskets was immediately emptied into large jars, to be boiled for about two hours, when the mass is strained in order to separate the numerous small black seeds. The juice is boiled for hours longer until it becomes sirup (*sítoli*), which is kept for future use in small earthen-ware jars, each neatly sealed with a piece of broken pottery and sticky mud. Being pleasant to the taste and much superior to molasses, I found this sirup excellent as part of my provisions. I also relished the fresh juice of the fruit when brought in cool in the morning.

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[Facing p. 96]

PAPAGO ETHNOLOGY

a (Santa Rosa, height, 29 ctm.); *b* (Kvîvo); *c* (Ânekam); *d* (Âktjin): Singer's masks. On the red (upper) section the zigzags mean clouds, on the white (lower) section the zigzags mean clouds and lightning; dots symbolize grains of corn. *e*, length, 77 ctm.; *f*, length, 76 ctm.; *g*, length, 41 ctm.: Ancient wooden hoes from Ânekam, used by women. *h*, twig of greasewood, used for scratching oneself when on salt expeditions; length, 18.7 ctm. *i*, bull-roarer; the triangles symbolize clouds; the lines (red) descending between the triangles indicate lightning, and the dots are corn, length of longest, 50.7 ctm. *k*, old Papago arrow, with obsidian point, from cave in Baboquivari range, total length, 1 metre. *l*, stick for bringing down sahuaro fruit; total length, 4 metres.

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241
411
412
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532

7: Lumholtz N-5 (1909-1910) 1912
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for agricultural interests, and the small stream which as a quiet brook passes back of the church represents the last of the Altar River, soon to disappear into the sand.

In this church it was that the population took refuge in 1857 to defend itself against the American filibusters under the command of Captain H. A. Crabbe who invaded the pueblo. The presidente of Caborca accompanied me up into the tower to show me the marks of the enemy's bullets. The Americans had entrenched themselves in a private dwelling opposite, maintaining probably a well-directed rifle fire. A Papago Indian saved the day for the Mexicans by ingeniously attaching fire to an arrow which he shot from the tower onto the straw roof of the American fortress, thereby succeeding in igniting it, which forced its surrender. The Americans were all shot, for times were rough in those frontier days.

The Papago Indians of Caborca number eight families who live in the suburbs, most of them making their living by working for the Mexicans. Two families still possess nice, large fields where both maize and wheat are raised and where splendid specimens of the wild fig trees (Spanish, *biguera*) were conspicuous; this fruit is gathered twice a year and eaten fresh or dried. Other fruit trees here were granadas and peach trees, as well as the ever-present nopal cactus, which is so useful to the natives, both stems and fruit being relished. There are great numbers of the giant cactus growing between here and the coast, but the fruit has not been gathered for several years. It appears that a feast at which sahuaro

7: Lumholtz N-5 (1909-1910)1912
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Sand Papago

seventy years ago—because the old men who had charge of the ceremonial objects of the feast had died, and it was decided that the latter should be taken care of at Quitovac.

These sand people were intelligent, healthy, and able-bodied, and managed to make a good living in an absolute desert. Their existence depended upon the knowledge of the few places in the mountain ranges, not even one in each range, where rain fills the tinajas, as well as of the few places along the coast where water can be found by digging for it. Once where to look for water is known, the difficulties in making a living out there are not so great as one would expect. In hot weather they followed jack-rabbits in the loose sand until the latter were exhausted, and caught muskrats by burning the accumulations of cactus spines with which those animals keep enemies away from their burrows. They also killed mountain-sheep, which were not a difficult quarry, with their bows and arrows, especially in the large craters, and they were even able to approach mule-deer and antelope near enough to kill them by the same weapon. Lizards were eaten. At certain seasons they went to the coast for the fishing, catching as many fish as they wished.

A single agricultural site may be attributed to the sand people, called Súvuk, south-east of Tinajas de Emilia, in Pinacate. Maize, squashes, and beans were planted here by means of a stick, on a very small scale, but the majority of these people had no agriculture whatever. They found good edible plant food in the dunes, especially *ammobroma sonoræ*, the wonderful camotes

7: Lumholtz N-5 (1909-1910) 1912
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Sand Papago

which the Indians knew how to gather all the year round, though after May that part of the plant which is above ground withers away. They had their season of chia and used to come as far as Quitovaquita and Santo Domingo to gather mezquite beans (called by the Mexicans *pechita*) and eat sahuaro and pitahaya. Near all the tinajas are seen round holes from six to ten inches deep, made into the solid rock, in which these Indians pounded mezquite beans. Their pestles are frequently found. The beans of the palo fierro were toasted, ground, and consumed as pinole. After the scanty winter rains the juicy plant of the sand dunes, *œnothera trichocalyx*, was boiled and eaten.

The clothing of these people was made from the skin of mule-deer, antelope, or mountain-sheep. The hair was first removed with a bone taken from the lower foreleg of the animal, and the skin was smeared with the brains. The root of the torote tree, crushed and left in water, furnished necessary material for the tanning process. The man wore shirt and breech cloth, the woman a short skirt. They killed sea lions on the rocks by hitting them on the nose, and from their skins sandals and straps were cut. From the badger's hair they were able to plait ribbons for the hair and make twine to be used for the breech cloth. Women wore sandals, but no hair ribbons. The skirt was kept up by strings of buckskin.

The burden basket was not used, but they made carrying nets as well as pottery, material for which is abundant on the coast. Baskets were manufactured from torote, willow, and bulrushes. In order to make bows, these Indians travelled as far as the Colorado River to get

8: Pijoan, Elkin & Eslinger D-5 (ca. 1942)1943
NU28 Papago NU28

pepo; Cucurbita moschata), dried chili (Capsicum annuum), a native spinach or pigweed (Ameranthus Palmeri), and whole wheat and peeled wheat (Tricitum vulgare). The majority of these foods are dried for storage.

The Papagos utilize for consumption the available varieties of cactus as they did aboriginally, gathering the fruits of the cholla (Opuntia echinocarpa) and various other kinds of prickly pear (Opuntia spp.) and the sahuaro (Carnegiea gigantea). The fruits are eaten in large quantities during season and in most instances these are baked for 24 hours in pits partially filled with hot stones; the surplus is dried for storage. The sahuaro fruit is often prepared as a syrup or jam. The seeds of the cactus are dried and later these are ground into a meal from which they prepare a gruel. In most of their cooking the Papagos use quantities of fat, especially lard or vegetable shortening.

In general it can be said that the diet of these people is one rich in cooked carbohydrate, with occasional animal protein and, in rare instances, cooked green fruits or vegetables. The Papagos drink but little milk (except from the breast during infancy); most of the natives in the outlying districts drink no dairy milk at all. As a result of their diet numerous avitaminoses occur, superimposed one on the other; the deficiencies may be subclinical or threshold in character due to a continued shortage of vitamins in the diet.

ASCORBIC ACID STUDIES

Various studies in the literature indicate that the ascorbic acid content of the plasma and the amount excreted are an index of the previous dietary intake (Belser, Hauck and Storvick, '39; Heinemann, '38). On the other hand, reports have appeared where the blood analyses themselves are used to determine the actual state of ascorbic acid nutrition (Minot, Dodd, Keller and Frank, '40). In some instances the blood and urine analyses have been supplemented by the determination of ascorbic acid in the dietary intake (Todhunter and Robbins, '40; Goldsmith, Ogaard and Gowe, '41). However, as Bessey and White ('42) have pointed out, the practical problem is one

11: Hoover U-4, 5 (ca. 1930) 1935
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coyotes, and decayed vegetables.[14] Settled again from Tecolote, Poso Verde, situated in a semicircle of foot hills, is now one of the most pleasing of all the Papago villages.

The "trincheras" or walled fortifications on the isolated mesa four miles east of San Miguel were built by the Papago as a retreat in case of Apache raids. They are in this respect distinct from the prehistoric trincheras on the mount just south of Sells, near Poso Verde, and through the Altar Valley, described by Sauer and Brand.[15]

The most important factor in making new and smaller settlements desirable has been the introduction of cattle, dating from the journeys of Father Estubio Kino, 1691–1702, followed by those of Father Garcés, 1768–1775. Along with Christianity, Father Kino introduced cattle, horses, and chickens. Cattle did not become important with the Papago, however, until the latter part of the nineteenth century, and the extensive areas between their limited fields were of little use to them except as game preserves. By hunting and gathering in these areas, they supplemented the produce of their fields, but no inducement was offered to permanent settlement of these areas. In 1849–1850 John Audobon described the Papago as fast passing away, judging from the dilapidation of the towns and the number of empty houses.

> The people live on turtles and what game they can get. I have seen small elk and antelope skins dressed and terrapin shells are everywhere. We have bought two terrapins fresh killed, some roots, and the fruit of a plant called the manguey.
>
> Why it is that these Indians settle in such a country, I cannot conceive, for even the lizards, in most places innumerable, are scarce here. The Indians kill them with a light wand, giving them a dextrous tap on the head. They pick up the game, slip the head under a belt or string round their waists, and when sufficient are collected, a little fire is made, and this delicate repast is enjoyed by them as an epicure would relish his brace of woodcock.[16]

Audobon also described a sort of mush made of grasshoppers. The insects were caught and dried, then pounded and mixed with meal or pinole, parched wheat or corn, spiced and pounded.

Pastoralism is better suited to a scattered population, so the tendency has been for the larger villages to break up into more scattered settlements. The passing of the old Tecolote village in favor of smaller communi-

[14] J. Ross Browne, Adventures in the Apache Country (New York, 1874), p. 277.

[15] Carl Sauer and Donald Brand, Prehistoric Settlements of Sonora, with Special Reference to Cerros de Trincheras (University of California Publications in Geography, Vol. 5, No. 3, 1931), espc. pp. 67–70.

[16] Audobon's Western Journal, 1849–50 (Cleveland, 1906), pp. 149–50.

13:Davis E-5 (1920)1920 NU28 Papago NU28

796 an arrow at it. The other went through the motions of killing the game by smashing the skull, and threw it over his shoulder. Then they went in search of more tracks, and in turn killed jackrabbits, deer, antelope, and other game, one at a time.

When the banner was paraded, one man carried a bush from which the clowns appeared to pick things. These represented [222] large, fat, yellow worms, which in the spring are sometimes found on bushes and are eaten by the Indians. The clowns gathered these in pantomime, and then built a fire to roast and eat them. Four times the [789] banner was paraded about the ground. It appeared to be a small square of white sheeting, upon which was painted a crude rainbow, clouds, and rain. Presumably it was intended to bring rain or to prevent [273] drought. Late in the afternoon many of the Indians, drunk from tizwin, staggered about the ground.

At sunset the last of the ceremony took place. The priests led the masked dancers in front of the singers' booth, and there the four masked men danced and sang; then all

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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At the Well every family had a house or some sort of shelter, and there they kept a duplicate set of heavy household utensils such as jars and grinding stones.

When they settled for the winter the men hunted deer in the nearby mountains and the women made pottery and baskets, although many families wandered about hunting and trading and did not settle. The Altar valley in Sonora was productive all the year and families from the north traveled down there to work for their richer kinsmen. There was, in fact, a constant going to and fro over all Papagueria.

In June the white flowers began to appear on the giant cactus *(Carnegia gigantea)* and then every family returned to pick the fruit and to carry it down to the summer villages for their great yearly ceremony which would bring the rain. The rains came in July, then the fields were planted and the new year had begun.

In recent days these migrations have been extended rather than otherwise. The Papagos now plant winter wheat, as they were taught by the Spaniards, and must come home in May to harvest it. Often they go to the Gila and harvest the Pima crop, working on shares, and in July they go again to the Gila to pick the Pimas' cotton. Thus there are only a few months in the year when the people can be found at either the Fields or the Wells.

Houses at all the villages are now made of adobe. In the old days they were low, brush covered structures, of what has been called "wash basin shape," and the ceremonial houses are still made on that ancient pattern. There were no windows and no smoke hole. The door was a low arch, just high enough for a man to crawl through, and the only furniture was a number of mats made of sotol strips *(Dasylirion wheeleri)* laid around the edge of the one room, and which served both to sit and to sleep on. Valuable property, such as the man's bow and arrows and the woman's basketry materials, were thrust into thatch or hung from the rafters.

UNCULTIVATED PLANTS USED AS SOURCES OF FOODS, BEVERAGES, SMOKING, AND CHEWING MATERIALS

1. Foods

The Papagos, like other peoples in the area, exploited the vegetable resources of the desert to the utmost, and the same plant at different seasons would provide not only roots, greens or fruits for food, but twigs for basketry, wood for implements or sap for dye.

In years when the rainy season was late they lived entirely on wild foods without planting at all. When the foods ripened, during or after the rainy season, enough was gathered and stored to last throughout the year, but just before the giant cactus harvest, food became very scarce, as is indicated by one of their names for May, *ko'ohk macat*, "the painful moon."

Some foods like the hackberry were simply used by the people in the neighborhood, while others like agave and acorns were gathered by special parties and either utilized or traded. There was one island of unusual flora on Elder Brother's mountain, Baboquivari. Here, near a permanent stream, grew the special luxuries he had provided for his people, and parties went to pick them for trade or on behalf of a village. Certain staples, however, grew in great quantity and these were gathered by everybody.

Different parts of the territory used different magical practices to insure a good crop, the most common being to make effigies of the desired fruits and plant them in the gathering grounds after a night of ritual singing. Sometimes merely an ironwood stake *(Olneya tesota)* was planted instead of the effigy.

When a crop was reported ripe the village organized its food gathering expedition. If the expedition were for

222 only a day the women went alone; if it were a longer trip, whole families went. The younger women and boys fetched water daily, the men hunted and at times helped in the picking. In such cases the regular community life was transferred to the camp.

25/ The picking of a crop almost always entailed measures for storage, both to keep it from spoiling and to lighten the load on the return trip. The fresh product could be eaten only by those who were in the camping party since the hot sun would shrivel it within a few hours after picking; therefore, part of the gathering technique was the roasting, boiling, or winnowing of the product.

Greens

222 Small succulent plants:
262 *mo'otari (Franseria tenuifolia)* stalks, Summer
Lambsquarter, *hiwitcuis (Chenopodium murale)* stalks, Summer
Pigweed, *tcuhukia (Amaranthus palmeri)* leaves, July, August
Lambsquarter, *tcu'ari (Chenopodium* sp.) leaves, July, August
Cañaigre *(Rumex hymenosepalus)* leaves, Spring
Dandelion *(Taraxacum officinale)* leaves cooked or uncooked
Saltbush *(Atriplex wrightii)* branches, Summer

Larger, coarser plants:
Cane cactus, cholla, *wipinoi (Opuntia arborescens)* Summer
Jumping cholla, *ha:nam (Opuntia fulgida)* young shoots and buds, Summer
Many-colored tree cholla *(Opuntia versicolor)* young shoots and buds, Summer
Cholla, *tci'orim (Opuntia echinocarpa)* buds, May
Prickly pear cactus, *nohwi (Opuntia engelmannii)* leaves with thorns scraped off, sliced in strips, Summer
Mescal, American aloe, century plant, *a'o't (Agave americana)* crown with leaves removed, Winter; central flowering stalk before it emerges, Spring
Sotol, *umu'k (Dasylirion wheeleri)* crown with leaves removed; central flowering stalk before it emerges, May
Fishhook cactus, barrel cactus, *viznaga, tciaur (Echinocactus wislizeni)* pulp, May
Night-blooming cereus, reina de noche, *ho'o'k iva (Cereus greggii)* stalks

17:Castetter & Underhill N, E-5 (1931-1934) 1935
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The small succulent plants used as greens grow near the villages and can usually be gathered within a day's excursion. One informant said: "In the afternoon, my mother-in-law would say to us, 'let us go out and gather amaranth.' So I and my sisters-in-law would take our carrying nets, walk about half a mile from the camp and fill them. Then we made soup and that was all we had for supper" (the main meal). This and the other small greens mentioned are never dried and stored but, as with other fresh crops, the family lives on them almost exclusively while they last. The branches of the saltbush *(Atriplex wrightii)* are used for seasoning either in cooking or in pit-baking.

The buds and joints of the five species of Opuntia mentioned constitute a staple crop, probably because they grow so plentifully, and *O. echinocarpa* is found in abundance on the nearby hillsides.

The branches of the chollas are composed of easily detachable joints; the flower buds which develop at the tips of the branches are gathered as they come out in May. Whole cholla joints, as well as the buds, are pit-baked and dried. Women go out in parties to gather the crop, this being done with wooden tongs made of a length of giant cactus rib *(Carnegia gigantea)*, split in two. The buds or joints are collected in coiled basket bowls and brought to a central point where an old woman directs the baking. When the picking is ended, a pit is dug, stones placed in it and heated with a mesquite fire *(Prosopis velutina)*, since creosote bush *(Covillea glutinosa)* burns up too quickly. When the stones are hot they are removed and the pit lined with ink weed *(Dondia nigra)* or with grass. Next a layer of buds or joints is placed in the pit, then hot stones, then the pit filled with alternate layers of ink weed or grass and buds and covered with earth. They camp all night while the product is baking, and roast in the campfire ashes that portion of the product which has been reserved for their evening meal. The women carry home the roasted cholla

251 and continue to go out for other batches until a large area surrounding the village has been picked over. The roasted
252 buds are used with greens of the annual salt bush *(Atriplex wrightii)* or lambsquarter *(Chenopodium alba)* as a sort of vegetable stew.

222 Although all Papagos eat mescal *(Agave americana)*,
251 many of them get it by trade rather than at first hand. It
[438] grows on the hills along the present international border and is usually gathered by parties who go to Sonora to work during their winter wanderings, stopping for a week or two to pluck and bake the mescal, and when necessary storing it in pits until they are ready to carry it home.

[412] Digging sticks of any hard wood, made chisel-shaped by pounding with a stone and hardened in the fire, are used to hack the plants off at the ground. The spiny leaves are then chopped off with a mescal hatchet, a semi-circular stone blade of granite or diorite.

251 The agave is pit-baked for twelve or more hours in the same way as are the cholla buds and joints. When this is done the remains of the leaves are pulled off, leaving an inner succulent mass about the size of a cauliflower. This has a slimy consistency and a sweet taste which is highly regarded. It is kept in jars to be eaten a little at a time or traded as a delicacy.

222 The flower stalks of the American aloe *(Agave americana)*, of sotol *(Dasylirion wheeleri)*, and the shoots of the night-blooming cereus *(Cereus greggii)* are also eaten as greens. They are not very extensively utilized however.
[285] Sotol is also a source of basketry material, but if the inner tender leaves have been taken for this purpose, the flower stalk does not develop. The flower stalks are dug out of the plants with a long stick having a chisel-like end, and cooked immediately but never stored.

252 An upright species of prickly pear cactus *(Opuntia*
222 sp.) is utilized by washing the large waxy flowers to remove their sticky secretion then frying them in grease, formerly deer fat, now lard.

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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Another occasional food, or more accurately a drink, is the pulp of the *viznaga*, barrel or niggerhead cactus *(Echinocactus wislizeni)*. If one becomes thirsty on a journey he cuts the top off a plant with a sharp stone, pounds the pulp and scoops out the juice with the half gourd *(Lagenaria vulgaris)* which he carries as a drinking and eating vessel.

According to Thackery and Leding (25), the fruits of the viznaga are cut up and cooked with cornmeal or other material, the seeds being discarded.

Root, Tuber, and Bulk Crops

Sand-root, *caa't (Ammobroma sonorae)* October
Wild potato, *taiaroti*. A climbing species of *Solanum*. Summer
***mo'otari (Franseria tenuifolia)* Summer**
Wild onion, *sipuia* (Span.) *(Allium unifolium)* May
Papago Blue Bells, Covena, *ha'at (Brodiaea capitata* var. *pauciflora)* April
Night-blooming cereus, *ho'o'k iva (Cereus greggii)*

The staple root crops are the sand-root *(Ammobroma sonorae)* and the root of *Franseria tenuifolia*, both of which appear on the flood plains near the villages after the rains. Whole families go out with digging sticks usually in October to gather the roots of these species, and live upon them while they last. Any surplus is sun-dried on the house-roofs and stored in jars.

The sand-root has been used from time immemorial by the Papago and is parasitic upon the roots of the small desert shrubs *Coldenia plicata* and *C. Palmeri*, as well as on *Eriogonum deserticolum*. It is to be found in parts of the Southwest where the average rainfall is between only two and five inches, and is eagerly sought by the Papagos, who consider it a most excellent food; it is eaten either raw or roasted (6, 17, 24).

Palmer (20) records that these people dried and ground the stems of the sand-root with mesquite beans *(Prosopis*

velutina) to make a pinole,[1] and discusses its general use and preparation, while Havard (14) also refers to its use by the Papago.

Similarly the tubers of the climbing potato (a species of *Solanum*) and the roots of the wild onion *(Allium unifolium)* which grow only on Mt. Baboquivari, were collected in May and mid-summer, respectively. These two plants were brought back by hunters, or by individuals who made the long special journey to obtain them to trade for baskets, skins or pottery. The bulbs of Papago Blue Bells are eaten raw. They do not have a pleasing taste and are eaten largely because they appear in early spring, before other crops are ready.

The large root of the night-blooming Cereus *(Cereus greggii)* which may weigh as much as four pounds is chewed raw for thirst or may be baked whole in ashes, peeled and eaten.

Fruits[2]

Small fruits:

u:spa't (Condalia spathulata) Summer

Mulberry, *kohi (Morus microphylla)* Summer

Hackberry, *kom (Celtis reticulata)* Summer

Boxthorn, *kuawur (Lycium fremontii)* August

Mistletoe, *hakowa't (Phoradendron californicum)* Summer

Lote bush, *u:s tcul'tpa't (Zizyphus lycioides)* Summer

Bird Cayenne pepper, *tcirtipia (Capsicum frutescens* var. *baccatum)* August

Black oak, *toa (Quercus emoryi*, also *Quercus oblongifolia)* July

Bucknut, coffee berry, quinine plant, *kohwi (Simmondsia californica)* August

Cactus and Yucca fruits:

Giant cactus, sahuaro, *ha:canyi (Carnegia gigantea)* July

Organ pipe cactus, pitahaya, *tcutcuis (Lemaireocereus thurberi)* August

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1. The Papagos mean, by pinole, a gruel made of parched, ground cornmeal and water. Since the meal has been parched before the water is added, no cooking is necessary. Pinole was the only ration used on journeys, since it served both for food and drink. It was also the prescribed food during ceremonial purification.

2. The term fruit is here used in the botanical sense and thus covers berries, nuts, etc

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Prickly pear cactus, *nohwi (Opuntia engelmannii)* June, October
Cholla *(Opuntia fulgida)* August
Cholla, *tci'orim (Opuntia echinocarpa)* August
Soapweed, datil, *hoi (Yucca baccata)* (fruit *howitc*) Summer

Of the small fruits, *Condolis spathulata* is eaten only raw and not thought worth preserving. If hackberries *(Celtis reticulata)* or mulberries *(Morus microphylla)* are found near the village, carrying baskets are filled with whole branches of them by the women. Clusters of mistletoe *(Phoradendron californicum)*, which often grows on the mesquite bush *(Prosopis velutina)*, are gathered, their branches laid on mats, dried and the berries rolled free. These berries form a sticky mass which is further sun-dried and stored. The somewhat larger boxthorn berries *(Lycium fremontii)* are picked, dried and eaten like raisins. Only the fruit of the lote bush *(Zizyphus lycioides)* is cooked, and this is boiled to a syrup like the cactus fruits.

These people now use as seasoning the very pungent bird Cayenne pepper or spur pepper *(Capsicum frutescens* var. *baccatum)* which grows in the Baboquivari Mountains and apparently nowhere else in the state. This plant may have been introduced by the Papagos and is very much used by them in their daily life as a condiment on the table or for cooking with beans or other foods. It is this species that is cultivated farther south for the hot peppers. As one drives over the Papago Reservation and stops at trading posts he invariably finds dishes of these small, dry, red, extremely pungent berries offered for sale. These always find ready buyers among the Papagos and Mexicans.

Acorns *(Quercus emoryi)* ripen in July a little later than the giant cactus fruit, but grow in only a few hilly places, mostly at the south of the Papago territory, and are gathered on a long camping excursion similar to that for the sahuaro fruit. For the most part acorns are eaten fresh from the shell. Bucknuts *(Simmondsia californica)* are similarly eaten though not in quantity. Russell (22)

Russell (22) refers to the Papagos as trading acorns *(Quercus oblongifolia)* to the Pima.

The important fruit crop comes from species of cactus, and of these the giant cactus or sahuaro *(Carnegia gigantea)* is most outstanding, its ripening preluding the rainy season, the drinking ceremony, and the new year. The Papagos depend upon this fruit to a much greater extent than do any other Indian people of the Southwest, and some six hundred families gather about 100,000 pounds each year (25).

Every family has an accustomed camp on some slope where sahuaro grows, and here they have a rough shelter, with a water jar, perhaps a metate, and a cooking pot. Cactus camp is always an occasion of jollity. It means almost the first fresh food of the year, for much of the pulp is eaten fresh; the first taste of anything sweet; and, principally, the preparation for the great drinking ceremony which is regarded as responsible for bringing the rains.

The picking season lasts about two weeks. The women of the camp, sometimes assisted by the men, make two trips a day into an area perhaps half a mile square, which is their acknowledged territory, visiting every cactus plant in this area once in three or four days to gather the fruit as it ripens. Each carries a bowl-shaped, water-tight basket (more recently a lard pail is used) to receive the pulp. One large basket, used as a general receptacle, is propped in an ocotillo bush *(Fouquieria splendens)* at some central point.

The fruit of the sahuaro grows at the extreme top of the shaft, which is sometimes twenty-five feet high, or at the tips of the branches, and is hooked down with a long pole made of two giant cactus ribs spliced together. Formerly the splicing was agave fiber; now it is wire. At the top of this pole, and again at a lower point, perhaps five feet down, are affixed short transverse sticks of creosote bush *(Covillea glutinosa)* or of catclaw *(Acacia greggii)* for the purpose of aiding in dislodging the fruit.

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The fruit, if fully ripe, splits open when it hits the ground; if not, the woman twists off the fruit stalk which bears a hard circular calyx with sharp edges and with this she splits the fruit. In either case she scoops out the pulp from each half with two motions of her thumb and throws it into her basket, while the thorny shell she throws on the ground, taking care that its red lining falls uppermost, for this hastens the rain.

After each round the women pour the newly gathered pulp, of a deep crimson color, into a water-tight basket and soak it to remove the black seeds, which will later be used for flour. Since it shrivels within a few hours if left in the sun, they cook their harvest daily, usually at midday which is too hot for pulp gathering. The mother or mother-in-law officiates on this important occasion. She drains the water from the pulp, some of which has been soaking since the night before, breaks up the masses, shakes out as many seeds as possible, washes and dries these on a mat in the sun, and places them in a jar. The pulp, with double the quantity of water, is brought to a boil in a clay pot, then removed from the fire and placed in a straining basket. The liquid drained off is placed on the fire and boiled to a syrup, this being set aside from day to day. When the whole quantity is at hand it is sealed in a jar made air-tight by cementing a potsherd over its mouth with adobe mixed with fine grass or a transparent yellowish-brown "gum" gathered from the *samo prieto (Coursetia glandulosa)* upon which it is produced by a scale insect *(Tachardiella fulgens)* (25). This is the liquid from which the ceremonial drink *navai't* is made and each family keeps its supply to be fermented at the time of the general ceremony (see also Densmore, 9).

When the juice has been drained off as described above there remain the pulp and the seeds which can also be utilized. All households make cactus jam, the most important sweet in their diet, and for this only a portion of the juice is drained off. The remaining moist pulp is boiled to a sweet, sticky mass, looking much like raspberry jam.

If the liquid be drained off completely there remains a dry mass of fiber and seed which is further dessicated on the housetop. It is then beaten with a stick to separate the seeds and these are parched and stored; they may be used to make meal cake or as chicken feed. One final product from the giant cactus is oil, which can be extracted from the seeds by parching them, grinding and adding water, after which a small quantity of oil comes to the surface. The pulp, instead of being disposed of as described above, may be sun-dried, stored, and cooked up as needed to make syrup, or it may be eaten dry or after being moistened with water (25).

The smaller fruit of the organ pipe cactus or pitahaya *(Lemaireocereus thurberi)* is as highly prized as that of the giant cactus and may be treated in the same way. It is less common, however, and grows only in the southern part of Papagueria and in parts of modern Sonora. It fruits twice a year and its many low branches are so plentifully covered that the Papago name for Milky Way is "the second harvest of Pitahaya."

The word *pitahaya* was used rather loosely by the Spaniards as a name for several of the tall cacti of Spanish America, together with their fruits including the sahuaro *(Carnegia gigantea)*. Perhaps the earliest reference to the pitahaya is one quoted by Bancroft (1) who states that Juan de Oñate, conqueror and governor of New Mexico, while on an exploratory journey westward from his headquarters on the Rio Grande in 1604, reported that he at length came to a country where the "tierra caliente began to produce the pitahaya." Padre Kino (3), the Jesuit friar, whose explorations from 1687 to 1710 covered southern Arizona as far west as the Colorado River, recorded in his memoirs the use of cactus fruits by the Indians of that region.

The Papago distinguish two kinds of edible prickly pears *(Opuntia* sp.), one of which produces chills and nausea in susceptible people. Groups of women pluck the

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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fruits with tongs, pile them on the ground and brush them vigorously with creosote bush branches *(Covillea glutinosa)* to remove the spines, then carry them home and use them as an adjunct to a meal. The usual method of utilizing the fruit is to eat it fresh in large quantities while the supply lasts, unused fruit being dried or made into syrup. To dry it they scoop out the pulp and remove the large, hard seeds with the fingers, then spread grass on the ground and sun-dry the pulp on it for two days, after which it can be stored in a sealed jar. To make syrup they mash the pulp in a basket with a stick, squeeze out the juice and strain it twice; it is then boiled and again strained.

The fruits of the two chollas *(Opuntia fulgida* and *O. echinocarpa)* ripen in late summer, and are handled in the same manner as the buds, that is, gathered, pit-baked and carried home (25).

Similarly the datil fruit *(Yucca baccata)* constitutes an important staple crop which is gathered and preserved. As much as possible of the banana-shaped, sweet, pulpy fruit is eaten fresh and some carried home for that purpose. A gruel is also made from the fresh fruit. The seeds are removed by hand and the pulp ground on the metate, some cornmeal being rubbed on the metate and muller to prevent sticking. The pulp is then cooked with cornmeal and the seeds are dried.

In preserving the fruit two methods are employed. One is to open the fruit in the field and remove the seeds and fiber, these being taken home in sacks to dry. In drying they are spread on racks of sahuaro ribs *(Carnegia gigantea)* in the storehouse, and when perfectly dry are beaten on a mat to remove the fiber. The released seeds form hard lumps which are stored in baskets and ground into meal when needed. The other method is to dry the pulp in the field. Women scrape it out with the fingers, pat it into cakes and dry these on a hot stone. This drying is not sufficient for storage so the cakes are taken home and spread on the roof, and when thoroughly dry are stored in a jar.

Seeds[3]

Sacaton, *ohki (Sporobolus wrightii)* September
Peppergrass, *ka:cowani (Lepidium thurberi)* September
opom (Monolepis nuttalliana) September
Pigweed, amaranth, *tcuhukia (Amaranthus palmeri)* September
Tansy mustard, *cu'uwa'ṭ (Sophia pinnata)* September
Mesquite, *kui (Prosopis velutina)* August
Little leaf horse bean, palo verde, *ku'k tcïata'k (Parkinsonia microphylla)* August
Jerusalem thorn, bagote, palo verde *(Parkinsonia aculeata)* August
Ironwood, palo de hierro, *hoitkam (Olneya tesota)* August
Devil Claw, unicorn plant, *ihu'k (Martynia fragrans)*

The species of grass seed which ripen in September and October around the villages are collected and winnowed. One informant said "We would work all day and feel as though we had done so much and there would be about a cupful." One method of winnowing is to pull up whole plants, lay them on a fiber mat and beat out the seeds with a stick. Another method, which is used with a very light grass, sacaton *(Sporobolus wrightii)*, is to burn the whole patch, then sweep the seeds off the ground. With *Monolepis nuttalliana*, the seeds of which are difficult to remove, the method consists in boiling the stems, then collecting the seeds from the bottom of the pot. The seeds of Amaranth or pigweed *(Amaranthus palmeri)*, so important among the Aztecs, are also collected and utilized as an important source of food. The most common of the seed crops, however, is tansy mustard *(Sophia pinnata)*.

The technique for storage of all seeds is basket-winnowing, parching and sun-drying. This winnowing is the same as that practiced by the Pimas and many of the Yumans, and consists in shaking the seeds horizontally in a flat basket, now and then jogging the basket so that the chaff is brought to its upper edge to be taken off by the wind. Seeds are never stored without cooking for fear of mildew. While parching they are placed in a flat basket with a few

3. Botanically some of these are fruits.

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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embers and shaken constantly to prevent burning. Or they are placed on a piece of broken pottery jar directly over the coals and the seeds stirred with a stick; after parching they are spread on the house roof for thorough dehydration before being stored.

Mesquite beans *(Prosopis velutina)* ripen in August near the summer villages and formerly constituted an important crop. The pod, which was much prized, has a sweetish taste and could be eaten fresh.

These beans could be either ground up like other seeds as flour, or the bean and pod could be pounded into a pulpy mass in a mortar, since they were too sticky for the metate. The resulting pulp was boiled. Beans were dried in the pod if they were picked near home, as the bulk was not too much to carry. In that event they were spread on the house roof and turned until thoroughly dried, then put away in a jar. If bulk needed to be reduced the sun-dried pods were flailed to beat out the seeds, the whole then winnowed in a basket and the seeds parched and stored.

The other legumes, ironwood *(Olneya tesota)* and palo verde *(Parkinsonia microphylla* and *P. aculeata)* produce beans which were flailed, winnowed, and parched in the same way as that described for mesquite.[4] The seeds of the devil's claw *(Martynia fragrans)* are also boiled and eaten.

2. BEVERAGES

Sahuaro, giant cactus, *ha:canyi (Carnegia gigantea)* juice fermented
Pitahaya, organ pipe cactus, *tcutcuis (Lemaireocereus thurberi)* juice fermented
Prickly pear cactus, *nohwi (Opuntia engelmannii)* ---juice fermented
Lote bush, *u:s tcui'tpa't (Zizyphys lycioides)* -------juice fermented
Jimson weed, thorn apple, *kotata'p (Datura meteloides)* root ground and infused
Tansy mustard, *cu'ɯwa't (Sophia pinnata)*----------made into tea
Sage *(Salvia columbaria)* ----------made into tea
Broomweed *(Baccharis sarothroides)* ----------made into tea
Joint Fir *(Ephedra nevadensis)* ----------made into tea

4. The chemical composition of the beans of *Parkinsonia aculeata* has been investigated by Robert A. Greene, Bot. Gaz. 94:411-415, 1932. He has found the composition of the whole bean to be similar to that of alfalfa hay or mesquite beans.

17:Castetter & Underhill N,E-5 (1931-1934) 1935
NU28 Papago NU28

241 present irrigation is practiced in the same river valleys where the Spaniards found it, although only one of the irrigated localities falls within the United States Papago Reservations with which the present paper is concerned. This is San Xavier del Bac, outside Tucson. The old residents of this district died out during epidemics and Apache raids, and Papagos from the desert have moved in within the last sixty years to take their places. Through the rest of the area the old Papago settlements plant *de temporal* as formerly. The government wells scattered through the reservation are used for watering stock, and to make it possible for the residents to remain the year around, but they do not affect agriculture.

132 The rainy season in Papagueria is concentrated in July and August, when almost all of the five to eight inches falls. The washes, dry for the rest of the year, are at times filled for a few hours with a torrent of muddy water which sometimes covers the adjoining land to a depth of two or three inches, and it is after the ground has been thus moistened that the Papagos break it up for planting.

132 In the first bulletin of this series (6) reference was
241 made on authority (22) to the Papago as never having been
222 an agricultural people, depending entirely upon the wild products of nature for their food supply. A study of the Papago as indicated above has shown however that this needs qualification; they do exploit the vegetable resources of the desert to the utmost, and in years when the rainy season is late live entirely on wild products without planting at all; nevertheless, they have at least at times a rather well developed agriculture. July is known among them as the "Month of Rains" and August as the "Month of Short Planting." If the heavy rains are delayed until August, these people sometimes do not plant at all since the growing season is too short to allow the crops to mature before frost. In this event they change their whole scheme of living; they eat the seed-corn and beans and spend the rest of the summer in food gathering and the winter working wherever employment can be obtained.

aridity, and the replacement of grass by mesquite, shrubs, and cactus, the distribution and abundance of grass is closely controlled by precipitation, with most of the growth taking place each year in August. In general, the best grassland is at the higher elevations of the reservation (excepting the rougher summits of the mountains and ridges), that is, on the slopes of the Baboquivari Mountains and in other scattered locations where precipitation is favorable. In this connection it is of interest that Richard J. Hinton described the country for 38 miles west of the Baboquivari Mountains as "fine grazing land" in 1878 (The Handbook to Arizona), whereas the grass got progressively poorer as he travelled further west.

A large number of the common desert plants were traditionally used by the Papago, particularly as food, and also as the materials of which houses, baskets, and numerous tools and utensils were constructed. Particularly important were the fruits of the sahuaro and mesquite and seeds of sacaton grass, and pigweed or amaranth. From spring through late summer, many plants were valued as greens, contributing importantly to the diet: lambsquarter, carnigre, the buds of the cholla, the mescal or century plant, sotol, and others.

222 178 The collecting and preparing of these plant foods was time-consuming and required a specialized knowledge of their potentialities with the result that their use is gradually disappearing. Nevertheless, some of these wild foods will continue to contribute a minor part of the diet for some time to come.

136 In contrast to the variety and relative importance of wild plant sources of food, the desert offered only a 224 sparse animal life for economic exploitation. Before the introduction of horses and cattle, the mule deer was much more abundant and widespread and was the chief game animal of the Papago. Of less importance were the white-tailed deer, the antelope, mountain sheep, and the peccary or javelina. Small animals were also hunted, particularly the jackrabbit, the cottontail rabbit, and the packrat. Game [223] birds, such as the quail and dove were also important. In general, hunting of larger animals was an occupation only occasionally indulged in by a few men; other animals were hunted more systematically, but hunting was always a relatively minor activity for the Papago. The small scale of more recent use of faunal resources is indicated by the fact that, during World War II, "due to the wartime price of fur, eight whites and two Papagos . . . (were) engaged in trapping and making considerable money at it" (Program, Papago Reservations, 1944, p. 15).

361 Some other localities are used temporarily or
221 seasonally as cattle and farm camps and others are used
[222] during the season of saguaro fruit harvest. It has been noted that in some instances scattered settlements are also used as "vacation" homes.

161 The Papago Population. The aspect of the Papago population most important to this study is its small size,
[162] relative to the large area it occupies. It is scattered over the entire Reservation in small villages, none of more than two or three hundred people with the exception of Sells,
[433] the largest town, where about 650 reside (Table 5). Never-
[182] theless, because the resources of the region are limited, the relatively small population is supported only inadequately, and its exact size is of importance in evaluating the relationships between the people and their resources.

[162] According to the count completed by the Bureau of Ethnic Research for the year 1959, which will be reported on in detail below, the total population of the main reservation was 4,166, with 628 additional Papagos on the San Xavier and Gila Bend reservations and 6,981 living elsewhere or with residence unknown, for a total living Papago population of 11,775.

The main reservation population of 4,166 compares with a total of 5,313 Papagos located on the reservation in 1914, according to a count made by Herbert V. Clotts (Clotts 1915). It must be assumed that there were relatively few Papagos off the main reservation in 1914 and

3: Whited G-5 (1890) 1894 NT15 River Yumans
Papago NV28

133 134 PHYSICAL CHARACTERISTICS OF THE REGION.—The territory covered by the Papagos in their migrations, and in which their villages are located, consists of mountain ranges and the intervening valleys. The soil of the valleys contains a considerable proportion of clay, so that it is all called adobe soil. In the mesas or plains occasional strips of sand occur. Along the arroyos, or dry water channels, deposits of gravel are numerous. The arroyos become raging torrents during the rainy season, rendering travel impossible or dangerous during the temporary flood. The soil of the foothills is very rocky. Alkali is present in the soil in varying proportions, giving the characteristic name to the vast stretch of country known as the alkali desert. It is not the presence of alkali, however, that makes the desert, but the absence of water. An abundant water supply renders this alkali soil equal in fertility to any soil in the country. As it is, the valleys contain a great deal of arable land, 137 which is evident from the great areas covered with grass, which form the stock ranges, and from occasional sections where weeds grow so luxuriantly after the rainy season as to overtop a man on horseback. Some portions of the valleys are covered with mesquite trees and bushes, and also sagebrush, but these sections produce abundant crops when irrigated.

132 CLIMATE.—The climate is very mild, being neither extremely cold in winter nor hot in summer. The mean average temperature during the summer of 1889 was 81.5°, and during the winter of 1889–1890 it was 52.6°.

312 WATER SUPPLY.—There are occasional wells found among the Indian villages. Natural water holes are quite numerous, and by raising embankments of earth in favorable localities the Papagos make [illegible] ponds or reservoirs, which they call tanks. These natural and artificial reservoirs are only serviceable for the temporary storage of water, and toward the last they become filthy mudholes. The Indians, however, continue to use the water as long as it can possibly be considered a fluid. In one place the Papagos have dug a well 80 feet deep, and with incredible labor have made a footpath from the top of the ground to the level of the water.

Water is found by boring at a depth of from 200 to 600 feet, but no flowing wells have yet been obtained in the territory. The water in the wells rises from 50 to 150 feet, and then is raised to the surface by steam pumps. The Indians, however, have not the financial resources with which to sink or operate artesian wells. When their tanks are exhausted they remove with droves and herds to the valleys and canyons in the mountains, frequently crossing over into Mexico.

137 TIMBER.—The varieties of timber within the Papago range are the willow, cottonwood, mesquite, polleverda, and on the southern and western mountain slopes the oak. The mesquite is the most common timber, as it grows freely on the mesas. It rivals the hickory as firewood, throwing out great heat, and the coals retain fire even longer than coals of hickory. The mesquite, however, is very easy to cut, and is handled with far less labor than hickory.

137 FRUITS AND NUTS.—The sahuaro (giant cactus), which grows on the rocky soil of the foothills and covers the moderate mountain ranges, rises in height from 10 to 60 feet, and is a mass of vegetable matter, supported by an internal skeleton of ribs or poles of woody fiber. The fruit of this remarkable plant grows out of the top of the trunk and arms, and constitutes an important article of food, the Papagos almost living upon it during June, July, 272 and a part of August. They gather it with long poles, and eat it either fresh or after it has been dried. They make 262 from the juice a sirup and a drink which is slightly charged with alcohol. Although the ribs of the sahuaro are [273] very valuable, the Indians never destroy the plant, and are greatly incensed if a white man cuts one down; but when the cactus dies and the vegetable matter dries, powders, and falls away, leaving the ribs exposed and bare, [313] they are used as supports for the dirt roofs of adobe houses, for the sides of houses when plastered with mud, for poultry and pigeon houses, and other small structures.

262 The Papagos eat the fruit of the prickly pear cactus and make a sirup from its juice; from the mescal (sweet [273] aloe) a highly intoxicating drink is made. The root, which is bulbous, grows partly under and partly above the ground, and when roasted it is very delicious, and great quantities are consumed by the Papagos. They dig out of the ground a vegetable which appears to be a species of wild onion, but they call it a groundnut, and relish it [388] highly when boiled. A very useful plant found in large quantities, called the soap plant (amole), forms a substitute for soap.

282 The tannin root, resembling the sweet potato in appearance, grows in great profusion. It contains a large portion of tannic acid, and is a substitute for the astringent barks, hemlock and oak, which are used in tanneries.

262 FOOD.—In addition to the fruits, nuts, and flesh already mentioned, their food consists of wheat flour (usually 252 formed by the women on a metate) prepared in simple ways, parched wheat and corn, boiled wheat and corn, flour made from the mesquite bean, beans, boiled squash, green and dried squash seeds, beef, and poultry.

181 INDUSTRY.—The Papagos seem to be esteemed by the whites in general as the best Indians in the territory. [464] They are industrious, and are good help in mines, on ranches, in the harvest field, and on stock ranges. They easily learn the mechanical arts, and set and handle mining drills as well as white men. The engineer at the Quijotoa mines said that his assistant was a Papago, and that he was fully competent to run the engine.

[312] In practical irrigation the Indians are conceded to be the superiors of the whites, and in their domain this is the foundation of agricultural skill. When properly educated there can be no doubt of their ability to acquire the scientific principles of the art.